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Risk Factors of Type 2 Diabetes Mellitus in Coastal Communities in the Working Area of Community Health Centre of Kapota of Wakatobi Regency in 2018

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Abstract

Type 2 diabetes mellitus is a degenerative disease that is dangerous and it can cause death. This disease is characterized by hyperglycemia and a disruption of carbohydrate, fat and protein metabolism which is associated with absolute or relative deficiencies of insulin secretion. This study aimed to determine the risk factors of type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota of Wakatobi Regency in 2018. This study used a case control design with a retrospective approach. The population in this study was all communities in the working area of Community health centre of Kapota aged 40-60 years old amounted to 900 people and the samples amounted to 60 people, namely 30 people for cases and 30 people for control. The sampling used simple random sampling technique.

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The results showed that family history and physical activity were the risk factors for type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018, while dietary pattern was not a risk factor for type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018.

Keywords: coastal communities; type 2 diabetes mellitus; family history; physical activity; dietary pattern

1. Introduction

Diabetes mellitus is a disease characterized by hyperglycemia and a disruption of carbohydrate, fat and protein metabolism which is associated with absolute or relative deficiencies of insulin secretion. Symptoms complained of in patients with diabetes mellitus are polydipsia, polyuria, polyphagia, weight loss, and tingling [1]. According to the American Diabetes Association in Amtrira, (2016) that a person is declared to have diabetes mellitus if the blood chemistry laboratory tests, blood glucose concentration in a state of fasting at least 8 hours is ≥ 126 mg/dL (7.0 mmol/L) or 2 hours after eating is ≥ 200 mg/dL (11.1 mmol/L) or if the moment is examined namely >200 mg/dL (11.1 mmol/L) [2].

The 8th edition of the International Diabetes Federation atlas in 2017 showed that the estimated number of people with diabetes mellitus in the age range of 20-79 years old per 1000 population in the world was 424,877.1 people and is expected to increase to 628,663.5 people in 2045. In the Western Pacific region which consists of several the countries in it (including Indonesia), have estimates of people with diabetes mellitus in the age range of 20-79 years old per 1000 population was 158,757.8 people and is expected to increase to 183,311.6 people in 2045 [3]. The number of deaths due to diabetes mellitus per 1000 population in 2017 was 114.1 people while the proportion of deaths due to diabetes mellitus in the age of <60 years old was 55.8% [3].

Based on Basic Health Research (Riset Kesehatan Dasar in Indonesia) in 2013, the prevalence of non-communicable diseases, especially diabetes mellitus, was based on blood tests in people aged ≥ 15 years old was amounted to 6.9% and in 2018 increased to 8.5% [4]. Data from the Health Office of Southeast Sulawesi Province in 2017 showed that diabetes mellitus is ranked 5th out of the 10 highest diseases in Southeast Sulawesi in 2017 with a total of 2,436 cases [5]. The prevalence of diabetes mellitus in Southeast Sulawesi Province in 2013 was based on a doctor's diagnosis in a population aged ≥ 15 years old was 1.3% and in 2018, it increased to 1.7% [4].

In the working area of Community health centre of Kapota, type 2 diabetes mellitus is a disease that ranks second in the list of diseases with a high number of cases. Based on the data obtained from the head of the non-communicable disease program in the working area of Community health centre of Kapota in Wakatobi Regency there were 41 patients with type 2 diabetes mellitus in 2017 and in May 2018, it increased to 50 patients [6]. Type 2 diabetes mellitus is a degenerative disease that is dangerous for the community. This diabetes caused 5.1 million deaths worldwide in 2013, and around 6 people die every second due to diabetes and spend 548 billion dollars to pay for medical expenses [7].

If a person has a family history of diabetes mellitus, then he is more at risk of developing diabetes than people who do

not have a history of diabetes mellitus [7]. The closer the relationship of lineage then has the greater the risk of developing diabetes mellitus. Based on the results of the initial observations carried out by researchers in coastal communities in the working area of Community health centre of Kapota there were several people with type 2 diabetes mellitus who have families suffering diabetes mellitus. The effect of physical activity is directly related to the increase in the speed of muscle glucose recovery (how much muscle takes glucose from the bloodstream). When physical activity, the muscles use glucose stored in the muscle and if glucose decreases, the muscle fills the void by taking glucose from the blood. This will result in a decrease in blood glucose levels which increases the control of blood glucose [8].

Type 2 DM is a degenerative disease that is strongly associated with dietary patterns. Dietary pattern is also a way or effort in regulating the type, amount and frequency of foods with specific intentions such as maintaining health, nutritional status, preventing or helping to cure illness. Changes in unhealthy dietary patterns cause metabolic disorders of food substances such as carbohydrates, proteins and fats that cause type 2 diabetes mellitus. Dietary patterns of coastal communities in the working area of Community health centre of Kapota for each individual varies in intake of carbohydrate, fat, protein, vegetables and fruits.

Based on this description then the researchers conducted a study with the aims to determine the risk factors of type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota of Wakatobi Regency in 2018.

2. Materials and Methods

This study used a case control design. In this study, the case group (the group that suffered from the disease) compared with the control group (the group that did not suffer from the disease). This study used retrospective approach (following the course of the disease). The population in this study was all communities in the working area of Community health centre of Kapota aged 40-60 years old amounted to 900 people.

The sampling size in this study used the sample size formula for the odds ratio hypothesis [9]. The results of the sampling size obtained samples amounted to 60 people (30 people for cases and 30 people for control). The procedure for selecting samples was done by simple random sampling. The simple random sampling is samples of the population taken have the same chance to be samples [10]. The samples in this study consisted of case samples and control samples with age categories 40-60 years old.

3. Results

3.1. Characteristics of Respondents

The characteristics of respondents in this study namely age, gender and occupation. These characteristics are presented in the table below. The results study of the 30 respondents for cases and 30 respondents for control showed that type 2 DM sufferers are at most 40-50 years old amounted to 38 people (63.3%). For the gender, there were more women, which amounted to 40 respondents (66.7%). Based on the type of occupation, most of them did not have occupation or as housewives as many as 31 respondents (51.7%).

Table 1: Distribution of respondents by age, gender and occupation in coastal communities in the working area of Community health centre of Kapota in 2018

Characteristics of Respondents	Cases		Controls		Total	
	n	%	n	%	N	%
Age (Years Old)						
40-50	19	63.3	19	63.3	38	63.3
51-60	11	36.7	11	36.7	22	36.7
Gender						
Men	10	33.3	10	33.3	20	33.3
Women	20	66.7	20	66.7	40	66.7
Occupation						
Housewife	17	56.7	14	46.7	31	51.7
Farmer	6	20.0	4	13.3	10	16.7
Fisherman	4	13.3	5	16.7	9	15.0
Trader	2	6.7	6	20.0	8	13.3
Employee	1	3.3	1	3.3	2	3.3

3.2. Risk Factors of Family History with Type 2 Diabetes Mellitus

The results of statistical analysis of risk factors of family history toward type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018 can be seen in the table 2.

Based on the table above, it was known that of 30 respondents (100%) in the case group, there were 16 respondents (53.3%) who had a family history of type 2 DM and 14 respondents (46.7%) who did not have a family history of type 2 DM. In the control group, of 30 respondents (100%) there were 4 respondents (13.3%) who had a family history of type 2 DM and 26 respondents (86.7%) who did not have a family history of type 2 DM.

The results of this statistical test obtained p value amounted to 0.003 which means that there was a significant relationship between family history and type 2 DM in coastal communities in the working area of Community health centre of Kapota in 2018. The results of statistical analysis by chi-square test related risk factors of family history toward type 2 DM at 95% confidence interval (CI) obtained OR value 7.429 with lower limit amounted to 2.078 and upper limit amounted to 26.553. The value interpretation of the lower limit and upper limit did not include the value of one then H_0 was rejected and OR was declared meaningful. So that it can be stated that family history was a risk factor of type 2 DM, meaning that people who had a family history of type 2 diabetes mellitus have a risk of suffering from diabetes mellitus 7.4 times greater than people who did not have family history of diabetes mellitus. Thus family history was a risk factor of type 2 DM in coastal communities in the working area of Community health centre of Kapota in 2018.

3.3. Risk Factors of Physical Activity with Type 2 Diabetes Mellitus

The results of statistical analysis of risk factors of physical activity toward type 2 diabetes mellitus in coastal

communities in the working area of Community health centre of Kapota in 2018 can be seen in the table 3.

Table 2: Risk factors analysis of family history toward type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018

Family History	Type 2 DM				Total		P	OR	Confidence Interval (95%)	
	Type 2 DM		Not Type 2 DM							
	(Cases)	(Controls)								
	n	%	n	%	n	%			Lower	Upper
At risk	16	53.3	4	13.3	20	33.3	0.003	7.429	2.078	26.553
Not at risk	14	46.7	26	86.7	40	66.7				
Total	30	100	30	100	60	100				

Based on the results of the study, it was found that of 30 respondents (100%) in the case group, there were 20 respondents (66.7%) who had risky physical activity and there were 10 respondents (33.3%) who had no risky physical activity. In the control group, of 30 respondents (100%) there were 10 respondents (33.3%) who had risky physical activity and there were 20 respondents (66.7%) who had no risky physical activity.

The results of this statistical test obtained p value amounted to 0.020 which means that there was a significant relationship between physical activity and type 2 DM in coastal communities in the working area of Community health centre of Kapota in 2018. The results of statistical analysis by chi-square test related risk factors of physical activity toward type 2 DM at 95% confidence interval (CI) obtained OR value 4.000 with lower limit amounted to 1.367 and upper limit amounted to 11,703. The value interpretation of the lower limit and upper limit did not include the value of one then H_0 was rejected and OR was declared meaningful. So that it can be stated that physical activity was a risk factor of type 2 DM, meaning that people who had risky physical activity have a risk of suffering from diabetes mellitus 4 times greater than people who did not have risky physical activity. Thus physical activity was a risk factor of type 2 DM in coastal communities in the working area of Community health centre of Kapota in 2018

Table 3: Risk factors analysis of physical activity toward type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018

Physical Activity	Type 2 DM				Total		P	OR	Confidence Interval (95%)	
	Type 2 DM (Cases)		Not Type 2 DM (Controls)							
	n	%	n	%	n	%			Lower	Upper
At risk	20	66.7	10	33.3	30	50.0	0.020	4.000	1.367	11.703
Not at risk	10	33.3	20	66.7	30	50.0				
Total	30	100	30	100	60	100				

3.4. Risk Factors of Dietary Patterns with Type 2 Diabetes Mellitus

The results of statistical analysis of risk factors of physical activity toward type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018 can be seen in the table 4.

Based on the table above, it was known that in the case group, there were 13 respondents (43.3%) who had risky dietary patterns and there were 11 respondents (56.7%) who had no risky dietary patterns. In the control group, there were 11 respondents (36.7%) who had risky dietary patterns and 19 respondents (63.3%) who had no risky dietary patterns.

The results of this statistical test obtained p value amounted to 0.792 which means that there was no significant relationship between dietary patterns and type 2 DM in coastal communities in the working area of Community health centre of Kapota in 2018. The results of statistical analysis by chi-square test related risk factors of dietary patterns toward type 2 DM at 95% confidence interval (CI) obtained OR value 1.321 with lower limit amounted to 0.469 and upper limit amounted to 3.721. The value interpretation of the lower limit and upper limit include the value of one then H_0 was accepted and OR was declared meaningless. So that it can be stated that dietary pattern was not a risk factor of type 2 DM in coastal communities in the working area of Community health centre of Kapota in 2018.

Table 4: Risk factors analysis of dietary patterns toward type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018

Dietary Patterns	Type 2 DM				Total		<i>P</i>	OR	Confidence	
	Type 2 DM		Not Type 2 DM						Interval (95%)	
	(Cases)		(Controls)							
	n	%	n	%	n	%			Lower	Upper
At risk	13	43.3	11	36.7	24	40.0				
Not at risk	17	56.7	19	63.3	36	60.0	0.792	1.321	0.469	3.721
Total	30	100	30	100	60	100				

4. Discussion

4.1. Risk Factors of Family History with Type 2 DM in the Coastal Communities in the Working Area of Community Health Centre of Kapota in 2018

People who have a family history of diabetes mellitus are more at risk of developing diabetes mellitus than people who do not have a history of diabetes mellitus [7]. The risk for diabetes from mothers is greater 10-30% than fathers, this occurs because the genes inherited in the womb are greater from the mother [11]. If siblings suffering from diabetes then the risk of developing diabetes are 10% and 90% if they are identical twins [12].

The results showed that of the 30 case group respondents, there were 16 respondents (53.3%) who had a risky family history. People who have one or more family members, both parents, siblings, or children who have diabetes, they have 2 to 6 times more likely to suffer from diabetes than people who do not have a family member has diabetes [13].

The results also showed that family history was not the only risk factor of type 2 diabetes mellitus. From the results of

this study was found that there were 14 respondents (46.7%) who suffered from type 2 DM but did not have a family history of type 2 DM. Another thing that causes DM is influenced by age, obesity and smoking. Some respondents aged 45 and 56 years, where the age factor can affect the decrease in mitochondrial activity in muscle cells, this is related to an increase fat levels in the muscle and trigger insulin resistance so that sugar levels increase. While smoking factors both active smokers and passive smokers, the inhaled nicotine can cause a reduction in insulin sensitivity and increase insulin resistance, so it triggering an increase in the amount of glucose in the blood which results in the emergence of DM. Obesity can cause the number of receptors and insulin sensitivity to decrease which resulting in reduced blood glucose into the cell and blood glucose levels increase beyond normal numbers.

This study is in line with the study conducted by Sari (2016) which states that there is a significant influence between family history factors and the incidence of type 2 diabetes mellitus. Respondents who have family history of diabetes had a risk of suffering from diabetes mellitus 5.6 times greater than people who have no family history of diabetes [7].

4.2. Risk Factors of Physical Activity with Type 2 DM in the Coastal Communities in the Working Area of Community Health Centre of Kapota in 2018

The effect of physical activity is directly related to the increase in the speed of muscle glucose recovery (how much muscle takes glucose from the bloodstream). When physical activity, the muscles use glucose stored in the muscle and if glucose decreases, the muscle fills the void by taking glucose from the blood. This will result in a decrease in blood glucose, thus increasing blood glucose control [8]. Lack of physical activity is one of the factors causing type 2 diabetes mellitus. If someone lacks of physical activity then the glycemic reserve or fat will remain stored in the body, this can lead to various degenerative diseases such as type 2 diabetes mellitus [14].

The results showed that physical activity was a risk factor related to type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota, in Wakatobi Regency in 2018. People who have a habit of doing mild physical activity had a risk to suffering for diabetes 4 times greater than people who have a habit of doing moderate physical activity or heavy physical activity. Based on the results of interviews, this was influenced by the majority of respondents did not have occupation and only as housewives as many as 17 respondents (56.6%), where the respondents did mild physical activity only.

Based on the study showed that there were risky physical activity, but did not experience diabetes amounted to 10 respondents (33.3%), this was because respondents maintaining healthy dietary patterns. Besides it, respondents also did not have family history suffering from diabetes. In addition, there were also respondents whose physical activity were not at risk but had type 2 diabetes mellitus, amounted to 10 respondents (33.3%). This is due to other risk factors, namely the influence of family history, smoking, age and irregular dietary patterns. This study showed that someone who did mild physical activity is more at risk to suffering from diabetes.

Physical activity is also one that can cause the risk of diabetes mellitus if a person in his life lacks physical activity or exercise, so that glycogen or fat reserves will remain stored in the body. This is what triggers various kinds of degenerative diseases, for example diabetes mellitus [15]. This study was in line with the study [7], which states that there was a significant relationship between factors of low physical activity and type 2 diabetes mellitus in the

community. Respondents who did mild physical activity at risk 19.5 times more likely to experience diabetes compared to respondents who did high physical activity. Likewise with the study [16], it showed that there was a significant influence between factors of physical activity and type 2 diabetes mellitus. Respondents who did mild physical activity had a 0.3 times greater risk to experience diabetes compared to respondents who did moderate physical activity.

4.3. Risk Factors of Dietary Patterns with Type 2 DM in the Coastal Communities in the Working Area of Community Health Centre of Kapota in 2018

A dietary pattern is an attempt to regulate the type, amount and frequency of meals in order to maintaining health, nutritional status, preventing or helping to cure illness. In this study, dietary pattern was used to determine an overview about the food frequency consumed by respondents. The results of measurement obtained from interviews to respondents using food frequency questionnaire form.

The results showed that dietary pattern was not a risk factor of type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018. Based on the results of the study showed that of 60 respondents (cases and controls), respondents who were at risk but did not have diabetes amounted to 11 respondents (36.7%). Based on the results of respondents' answers, this happened because respondents doing sufficient physical activity so that food intake enters the body balanced with energy expenditure. When viewed based on other characteristics, they also did not experience type 2 diabetes mellitus because they did not have a family history of diabetes. In addition, there were respondents who were not at risk but have type 2 diabetes mellitus, amounted to 17 respondents (56.7%). This happened because there were other supporting factors that cause diabetes, such as lack of physical activity intensity, age factor, family history who suffers from diabetes, and smoking factors both active smokers and passive smokers.

The results showed that dietary pattern was not a risk factor of type 2 DM. This was because the food consumed by respondents was almost the same both the intakes of carbohydrate, fat, protein, vegetable, fruit, snackss and soft drinks that distinguish the type of food and its frequency only. In terms of carbohydrate intake, more respondents consume white rice than cassava or sweet potatoes. While fat intake was obtained from chicken eggs, tofu, fried tempeh and other fried foods. In protein intake, it was more obtained on fish than squid, shrimp, clams or crabs. For vegetables, it obtained from kale, spinach, mustard greens, cabbage, eggplant, long beans and for fruits, it obtained from papaya, bananas, mangoes and apples. Based on the results of interview, it was found the respondents ate snacks rarely, such as biscuits and other snacks. They often ate bread or fried foods such as fried bananas, fried sweet potatoes, fried breadfruit, fried tofu and tempeh made by the local community of Kapota Island, which is it usually consumed in the morning or evening by the community. Some people ate it in the morning and evening accompanied by milk, energen, tea or coffee both black coffee or instant coffee, which can be obtained from the nearest kiosks.

The frequency of dietary patterns that were risky to respondents was influenced by several factors, such as they did not maintain their dietary patterns well and they often consume snackss and soft drinks such as bread, fried foods, box tea, glass tea, energen, milk, black coffee, instant coffee plus sugar (top coffee, abc mocca, white koffie), instant noodles, there are even respondents who consume tea or coffee, both black coffee and instant coffee with the amount of sugar

as much 1-3 tablespoons and it consumed one to two times a day. This study was in line with Maryani's study (2011) that there was no relationship between dietary patterns and type 2 diabetes mellitus [17].

5. Conclusion

Conclusion of this study was:

- Family history was a risk factor for type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018.
- Physical activity was a risk factor for type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018.
- Dietary pattern was not a risk factor for type 2 diabetes mellitus in coastal communities in the working area of Community health centre of Kapota in 2018.

Recommendation of this study namely for the health workers, especially those in the working area of Community health centre of Kapota, to optimize socialization activities in all communities so that they can increase their knowledge about the causes, symptoms, complications, preventions and risks of type 2 diabetes mellitus so the prevention efforts can be carried out such as increase the intensity of physical activity, especially for the people who have a family history of diabetes mellitus. In addition, it is hoped that the community make efforts to live a healthy life in order to prevent disease by doing physical activity regularly, maintaining dietary patterns and doing medical examination routinely.

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